

REMARKS

Claims 1-47 are currently pending. Of these claims, claims 5-7, 19-37, and 41-47 have been withdrawn from further consideration due to the previous Restriction Requirement. Claims 1-4, 8-18 and 38-40 are the only claims to have been examined on the merits. In this response, applicants amend claims 1, 9, 10, 14 and 15.

Claims 1-4 and 8-18 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner has three specific objections to the claims.

The Examiner first objects to the terms "elevating" and "elevated" in claims 1, 3 and 10. The Examiner takes the position that these claims are relative terms which lack a comparative basis.

In order to address this rejection, applicants have inserted a comparative phrase into the claim, indicating that the pH of the soil is elevated from an initial pH to a raised pH.

This clarification is made simply to advance prosecution, and the terms "elevating" and "elevated" are not intended to have anything other than their ordinary meanings.

The Examiner's second objection is regarding claims 9 and 14. The Examiner indicates that the phrase "mixture thereof" in these claims should be changed to "combination thereof". Applicants have complied with the Examiner's request. Applicants note that this change is made simply for clarification, and is not intended to affect the scope of the claims in any way.

Claims 38-40 are considered indefinite by reciting "a factor of" at least 2, 3 or 4. The Examiner takes the position that it is unclear how the factor is calculated.

Applicants submit that the Examiner's objection is misplaced. Merriam Webster's Collegiate Dictionary defines "factor" as "a quantity by which a given quantity is multiplied or divided in order to indicate a difference in measurement." An exemplified phrase in the

dictionary is "costs increased by a factor of ten". Thus, the term seems clear on its face. The concentration of metal in the above-ground tissues of the plant must exceed the concentration of the metal in the soil by a multiple of at least 2, 3 or 4 to fall within the scope of these claims. Applicants see no lack of clarity.

Claims 1-4 and 38-40 are rejected under 35 U.S.C. §112, first paragraph, because the specification, while being considered enabling for the use of hyperaccumulators of *Alyssum* species that accumulate nickel from soil, is not considered to reasonably provide enablement for any hyperaccumulator that accumulates any metal from the soil. The Examiner takes the position that the specification does not provide guidance for the use of non-*Alyssum* plants for the removal of other metals besides nickel. The Examiner notes that no guidance has been provided for the identification of other hyperaccumulator plants or the specific soil conditions which would permit these species to accumulate metals.

This rejection is respectfully traversed.

First, applicants note that the Examiner takes the position that applicants have not provided guidance for specific soil pHs, fertilizers, or chelating agents that would permit hyperaccumulator plant species to accumulate metals. However, page 8, line 25 through page 9, line 1 provides enabling disclosure as how to raise soil pH. As for fertilizers and chelating agents, page 18, line 6 through page 19, line 24 provides enabling disclosure on which additional ingredients would be useful for providing suitable conditions for metal hyperaccumulation by hyper-accumulator plant species. In addition, page 10, line 24 through page 17, line 31 provides an exhaustive list of hundreds of plant species useful in the present invention. Applicants do not see what more would be required for enablement.

The test of enablement is whether one reasonable skilled in the art could make or use the invention from the disclosure in the patent coupled with information known in the art without undue experimentation. *United States v. Telectronics, Inc.*, 8 USPQ 2nd 1217, 1223 (Fed. Cir. 1988). According to the factors recited in *In re Wands*, 8 USPQ 2nd 1400 (Fed. Cir. 1988), the factors determining whether any experimentation is "undue" include the breadth of the claims; the nature of the invention; the state of the prior art; the level of one of ordinary skill; the level of predictability in the art; the amount of direction provided by the inventor; the existence of working examples; and the quantity of experimentation needed to make or use the invention based on the content of the disclosure.

In this case, the breadth of the claims is not "undue", given that applicants have provided hundreds of potential species to be used in accordance with the invention. In addition, much direction has been provided by the applicants, including suitable ingredients useful for raising soil pH, and a list of fertilizers and chelating agents useful for optimum yield. In addition, several working examples have been provided which provide specific guidance in how the invention should be used. Thus, in this case, applicants submit that there is no "undue" experimentation such that an enablement rejection should stand.

Applicants respectfully request that the rejection be withdrawn.

Claims 1-4, 8-18 and 38-40 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable under claims 1-5 of U.S. Patent No. 5,711,784.

Applicants intend to file a Terminal Disclaimer to overcome this rejection. Until such time, applicants requests that this rejection be held in abeyance.

Claims 1-4, 8, 10, 12-13, 16-18 and 38-40 are rejected under 35 U.S.C. §103(a) as being unpatentable over Raskin et al. (U.S. Patent No. 5,785,735). The Examiner relies on Raskin as teaching methods for removing lead from lead-containing soil comprising soil treatments including soil pH manipulation to increase the availability of lead to plant roots, and cultivating *Brassica juncea* in the soil, whereby the concentration of lead accumulated in the shoots is 30 fold higher than the lead concentration in the soil. The Examiner refers to column 10, table 1. The Examiner also relies on Raskin as teaching other metals (the Examiner refers to column 2, lines 1-21), plants including *Alyssum* species (the Examiner refers to column 4, second full paragraph), and treating the soil with lime before sowing to maintain soil pH of 5.8-6.2 (the Examiner refers to column 7, lines 58-63). Therefore, the Examiner concludes, a person skilled in the art would have been motivated to use *Alyssum* species for the removal or high recovery of nickel with a reasonable expectation of success.

This rejection is respectfully traversed for the following reasons.

Raskin does indeed teach removing metals from metal-containing soil using plants of the family Brassicaceae. See column 1, lines 30-32. However, Raskin achieves this goal by, among other possible methods, **decreasing** the pH of the metal-containing soil. See column 1, lines 57-65 and column 7, lines 57 through column 8, line 24. The present invention, on the other hand, contemplates a metal recovery whereby the pH of the soil is elevated, not decreased. Thus, it is clear that Raskin could not render the present invention unpatentable. Applicants respectfully request that the rejection be withdrawn.

Claims 1-4, 8-18 and 38-40 are rejected under 35 U.S.C. §103(a) as being unpatentable over Raskin and further in view of Brooks et al. (1981). Raskin has been described. The Examiner admits that Raskin does not explicitly teach nickel accumulation by *Alyssum* plants. Brooks is relied upon as teaching accumulation of nickel by three different species of *Alyssum*, whereby one species accumulated 2.0% of nickel on a dry weight basis in leaves. The Examiner thus takes a position that it would have been obvious to one of ordinary skill in the art to use the teachings of Raskin, and to modify those teachings by incorporating the specific teachings of Brooks as to how selectively remove nickel from nickel-contaminated soil by using specific *Alyssum* species.


This rejection is respectfully traversed.

As applicants noted above, Raskin teaches removing metals from metal-containing soil by **decreasing** the pH of the soil. This teaching is completely contrary to the present invention, which uses an elevation of pH levels to recover the metals from soil. For this reason alone, no additional reference could render the present invention obvious, when combined with Raskin. According to the case *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303 (Fed. Cir 1983), a prior art reference must be considered in its entirety, including portions that lead away from the claimed invention. Since the Raskin reference is completely contrary to the present invention, no added reference could overcome the failure of Raskin to teach the invention.

Applicants respectfully request that the rejection be withdrawn.

In the event this paper is not timely filed, applicants hereby petition for an appropriate extension of time. The fee for this extension may be charged to our Deposit Account No. 01-2300, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,
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A method for selectively increasing the amount of at least one metal recovered from metal-containing soil comprising:

- (a) elevating the pH of the soil from an initial pH to a raised pH; and
- (b) cultivating at least one metal-hyperaccumulator plant in the soil having the raised pH under conditions sufficient to permit said at least one plant to accumulate said at least one metal from the soil in above-ground tissue.

9. The method of claim 8, wherein said *Alyssum* plant is selected from the group consisting of: *A. murale*, *A. pintodasilvae*, *A. serpyllifolium*, *A. malacitanum*, *A. lesbiacum*, *A. fallacinum*, *A. argenteum*, *A. bertolonii*, *A. tenium*, *A. heldreichii*, *A. corsicum*, *A. pterocarpum*, *A. caricum* and [mixtures] combinations thereof.

10. A method for recovering nickel from nickel-containing soil comprising:
- (a) elevating the pH of the soil from an initial pH to a raised pH;
 - (b) cultivating at least one nickel-hyperaccumulator plant in the soil having the raised pH under conditions such that at least 0.1% of the above-ground tissue of said at least one plant, on a dry weight basis, is nickel;
 - (c) harvesting said at least one plant; and
 - (d) recovering nickel from said harvested plant.

14. The method of claim 13, wherein said *Alyssum* plant is selected from the group consisting of: *A. murale*, *A. pintodasilvae*, *A. serpyllifolium*, *A. malacitanum*, *A. lesbiacum*, *A. fallacinum*, *A. argenteum*, *A. bertolonii*, *A. Teniu*, *A. heldreichii*, *A. corsicum*, *A. pterocarpum*, *A. caricum* and [mixtures] combinations thereof.

15. The method of claim 14, wherein said *Alyssum* plant is selected from the group consisting of: *A. corsicum* G16, *A. murale* G69, *A. murale* G82 and [mixtures] combinations thereof.